OCCUPATIONAL ANALYSES SERIES

Automotive Service Technician

2005

Human Resources and Skills Development Canada
Ressources humaines et Développement des compétences Canada

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Occupational Analyses Series

Automotive Service Technician

2005

Trades and Apprenticeship Division

Human Resources
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The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Occupational Analysis as the national standard for the occupation of Automotive Service Technician.

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OTHER RELATED OCCUPATIONAL TITLES

This analysis covers tasks performed by automotive service technicians whose occupational title has been identified by some provinces and territories of Canada under the following names:

- Motor Vehicle Mechanic
- Motor Vehicle Repairer

LIST OF RED SEAL NATIONAL OCCUPATIONAL ANALYSES

TITLE	NOC* Code
Appliance Service Technician (1997)	7332
Automotive Painter (2005)	7322
Automotive Service Technician (2005)	7321
Baker (1997)	6252
Boilermaker (2003)	7262
Bricklayer (2000)	7281
Cabinetmaker (2000)	7272
Carpenter (1998)	7271
Cement Finisher (1995)	7282
Construction Electrician (2003)	7241
Cook (2003)	6242
Electrical Rewind Mechanic (1999)	7333
Electronics Technician – Consumer Products (1997)	2242
Farm Equipment Mechanic (2000)	7312
Floorcovering Installer (1997)	7295
Glazier (2004)	7292
Hairstylist (1997)	6271
Heavy Duty Equipment Technician (2004)	7312
Industrial Electrician (2003)	7242
Industrial Instrument Mechanic (2000)	2243
Industrial Mechanic (Millwright) (1999)	7311
Insulator (Heat and Frost) (2000)	7293
Ironworker (Generalist) (1993)	7264
Lather (Interior Systems Mechanic) (2002)	7284
Machinist (1998)	7231
Metal Fabricator (Fitter) (2003)	7263
Mobile Crane Operator (1997)	7371

Motorcycle Mechanic (1995)	7334
Motor Vehicle Body Repairer (Metal and Paint) (2005)	7322
Oil Burner Mechanic (1997)	7331
Painter and Decorator (2000)	7294
Partsperson (1995)	1472
Plumber (2003)	7251
Powerline Technician (2004)	7244
Recreation Vehicle Mechanic (2000)	7383
Refrigeration and Air Conditioning Mechanic (2004)	7313
Roofer (1997)	7291
Sheet Metal Worker (1997)	7261
Sprinkler System Installer (2003)	7252
Steamfitter – Pipefitter (1996)	7252
Tilesetter (2004)	7283
Tool and Die Maker (1997)	7232
Transport Trailer Technician (2003)	7321
Truck and Transport Mechanic (2000)	7321
Welder (2004)	7265

* National Occupational Classification

Requests for these publications should be forwarded to:

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Human Resources and Skills Development Canada
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These publications are also available to order or download online at: **www.red-seal.ca**.

FOREWORD

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to co-operate with provincial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. To this end, Human Resources and Skills Development Canada (HRSDC) sponsors a program, under the guidance of the Canadian Council of Directors of Apprenticeship (CCDA), to develop a series of occupational analyses.

The Occupational Analysis Program has the following objectives:

- to identify and group the tasks performed by skilled workers in particular occupations;
- to identify those tasks that are performed by skilled workers in every province and territory;
- to develop instruments for use in the preparation of Interprovincial Standards "Red Seal" Examinations and curricula for training leading to the certification of skilled workers;
- to facilitate the mobility, in Canada, of apprentices and skilled workers;
- to supply employers and employees, and their associations, industries, training institutions and governments with analyses of the tasks performed in particular occupations.

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GUIDE TO ANALYSIS

DEVELOPMENT OF ANALYSIS

A draft analysis is developed by a committee of industry experts in the field led by a team of facilitators. This draft analysis identifies all the tasks performed in the occupation.

The draft is translated and reviewed by the NOA Team of HRSDC. A copy of this analysis is then forwarded to provincial/territorial authorities for review by specialists in the field. Their recommendations are assessed and incorporated into the final draft.

The occupational analysis is published in both official languages.

STRUCTURE OF ANALYSIS

To facilitate understanding of the nature of the occupation, the work performed is divided into the following divisions:

BLOCK – is the largest division within the analysis and reflects a distinct operation relevant to the occupation.

TASK – is the distinct activity that, combined with others, makes up the logical and necessary steps the worker is required to perform to complete a specific assignment within a "BLOCK".

SUB-TASK – is the smallest division into which it is practical to subdivide any work activity and, combined with others, fully describes all duties constituting a "TASK".

Supporting Knowledge & Abilities

The elements of skill and knowledge that an individual must acquire to adequately perform the sub-task.

Trends

Any shifts or changes in technology that affect the block.

Related Components

All components related to a specified block being undertaken by the automotive service technician.

Tools and Equipment

All tools and equipment necessary for the automotive service technician to perform the work on all given tasks identified within the block.

VALIDATION METHOD

At the request of the Canadian Council of Directors of Apprenticeship (CCDA), the Standardization Sub-committee developed a method for validating the Red Seal National Occupational Analyses.

A draft of the analysis is sent to all jurisdictions for validation. Each jurisdiction rates the sub-tasks and applies percentage ratings to blocks and tasks. This method for the validation of the National Occupational Analysis identifies common core tasks across Canada for a specific occupation. This feature facilitates the weighting of the Interprovincial Standards "Red Seal" Examinations.

DEFINITIONS

YES: the sub-task is performed by workers in the occupation in a specific jurisdiction.

NO: the sub-task is not performed by workers in the occupation in a specific jurisdiction.

BLOCK %: the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, that will be placed on an interprovincial examination to assess each block of the analysis.

TASK %: the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, that will be placed on an interprovincial examination to assess each task of the analysis.

NV: Not Validated by a province/territory.

ND: Not Designated in a province/territory.

PROVINCIAL/TERRITORIAL ABBREVIATIONS

NL:	Newfoundland and Labrador
NS:	Nova Scotia
PE:	Prince Edward Island
NB:	New Brunswick
QC:	Quebec
ON:	Ontario
MB:	Manitoba
SK:	Saskatchewan
AB:	Alberta
BC:	British Columbia
NT:	Northwest Territories
YT:	Yukon
NU:	Nunavut

COMMON CORE

The criteria for determining common core depend on the performance of sub-tasks. If at least 70% of the responding jurisdictions (excluding NVs and NDs) perform a sub-task, it shall be considered common core.

Interprovincial Standards "Red Seal" Examinations are based on the common core identified through this validation process. Validation identifies what will be assessed through the interprovincial examination.

BLOCKS AND TASKS WEIGHTING (APPENDIX D)

This appendix represents the block and task percentages as submitted by each jurisdiction.

Each jurisdiction, with the use of a provincial/territorial occupational advisory committee, validates the content, places percentages on blocks and tasks, and indicates whether or not the sub-tasks are performed by the skilled workers within the occupation. The results of this exercise are submitted to the NOA Team who then analyzes the data and develops this appendix which provides the individual jurisdictional validation results as well as the national averages of all responses.

PIE CHART (APPENDIX E)

The graph depicts the national percentages assigned to blocks in the analysis.

SCOPE OF THE AUTOMOTIVE SERVICE TECHNICIAN TRADE

Automotive service technicians possess the full range of knowledge and abilities required to perform preventative maintenance, diagnose problems and repair engines, vehicle management systems, steering systems, braking systems, drive trains, suspension, electrical systems, HVAC systems, trim and accessories of automotive vehicles and light trucks.

Automotive service technicians may be employed by automotive repair shops, dealerships, automotive specialty repair shops, large organizations that may own a fleet of vehicles and motor vehicle body repair companies.

While the scope of the automotive service technician trade includes many aspects of vehicle repair, many technicians specialize in particular areas of repair due to the complexity of today's motor vehicles.

Technicians usually work indoors and can expect a work environment that includes noise, fumes, odours, hazardous compounds, drafts and vibrations. Good physical condition and agility are important because the work often requires considerable standing, bending, crawling, lifting, pulling and reaching.

Some important attributes of automotive service technicians are: good hand-eye coordination, mechanical aptitude, time management skills, logical thinking and decision making skills, excellent communication skills and the ability to educate themselves as technology advances.

Experienced automotive service technicians may advance to shop foreman or service manager positions. Some technicians may open their own garage or automotive specialty shop. With additional training, technicians can transfer their skills and knowledge to related occupations such as automotive instructor, partsperson, truck and transport mechanic, agricultural equipment technician or heavy duty equipment technician.

OCCUPATIONAL OBSERVATIONS

The automotive industry is in constant evolution. Automotive service technicians must continually adapt to changing technology and repair techniques as vehicle components and systems become more and more complex. Ongoing training is necessary to update knowledge of new technologies. Technicians may upgrade their skills on-line, through video conferencing, satellite training and classroom delivery.

Computers are an integrated part of automobiles. Today, electronic systems and computers are essential to vehicle operation and also measure their performance. Automotive service technicians have developed into advanced technology diagnosticians. They require knowledge of all systems and their interaction to diagnose the cause of faults. Technicians frequently use electronic diagnostic and testing equipment.

Personal computers are also used by automotive service technicians to store and access reference materials. They provide automatic updates to keep technicians current on new technologies and procedures. In both large and small operations, technicians may have access to their own terminal to view work orders, reference material and manufacturers' information about the vehicle.

Many technicians specialize in particular areas of repair. Some technicians are trained and work exclusively on certain makes of vehicles. Specialization of technicians helps to reduce the time of diagnosis and repair.

New alternate fuelled vehicles powered by hydrogen fuel cells, electric fuel cells, natural gas, solar power, propane and other non petroleum-based sources will require additional training for technicians as they become more commonly used by consumers. New technology is yielding an increase of consumer purchasing of hybrid vehicles.

There is increasing awareness of personal safety regulations and standards.

Environmental concerns have changed the industry both with stricter emission controls and the disposal and recycling of materials.

SAFETY

Safe working procedures and conditions, accident prevention and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers and employees. It is imperative that all parties are aware of circumstances and conditions that may lead to injury or harm. Safe learning experiences and work environments can be created by controlling the variables and behaviours that may contribute to accidents or injury.

It is generally recognized that a safety-conscious attitude and work practices contribute to a healthy, safe and accident-free working environment.

It is imperative to apply and be familiar with the Occupational Health and Safety Acts and Workplace Hazardous Material Information System (WHMIS) Regulations. As well, it is essential to determine workplace hazards and take measures to protect oneself, co-workers, the public and the environment.

As safety education is an integral part of training in all jurisdictions, personal safety practices are not recorded in this document. However, the technical safety aspect relating to each task and sub-task are included throughout this analysis.

ANALYSIS

BLOCK A

OCCUPATIONAL SKILLS

Trends: *Increasingly sophisticated tools and equipment. Increased need to access more advanced information technology.*

Related Components: Not applicable.

Tools and Equipment: See Appendix A.

Task 1 Uses tools and equipment.

Sub-task

1.01 Uses hand tools.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

Supporting Knowledge & Abilities

1.01.01	knowledge of types of hand tools
1.01.02	knowledge of operating procedures
1.01.03	knowledge of imperial and metric systems
1.01.04	ability to apply hand-eye coordination
1.01.05	ability to organize hand tools
1.01.06	ability to maintain hand tools
1.01.07	ability to store hand tools
1.01.08	ability to recognize worn, damaged or defective hand tools

Sub-task

1.02 Uses power tools.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

1.02.01	knowledge of types of power tools such as electric, pneumatic and hydraulic
1.02.02	knowledge of operating procedures
1.02.03	ability to apply hand-eye coordination
1.02.04	ability to organize power tools
1.02.05	ability to maintain power tools
1.02.06	ability to store power tools
1.02.07	ability to recognize worn, damaged or defective power tools

Sub-task

1.03 Uses measuring and testing devices.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

1.03.01	knowledge of types of measuring and testing devices such as micrometers, vernier calipers, pressure gauges and digital voltage ohmmeter (DVOM)
1.03.02	knowledge of operating procedures
1.03.03	ability to use scan tools and diagnostic equipment
1.03.04	ability to make conversions between the metric and imperial systems
1.03.05	ability to organize measuring and testing devices

1.03.06	ability to maintain measuring and testing devices
1.03.07	ability to store measuring and testing devices

Sub-task

1.04 Uses hoisting and lifting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

1.04.01	knowledge of types of hoisting and lifting equipment such as jacks, chain hoists and vehicle hoists
1.04.02	knowledge of operating procedures
1.04.03	knowledge of applications of hoisting and lifting equipment
1.04.04	knowledge of limitations of lifting equipment
1.04.05	ability to recognize safe lifting locations or points
1.04.06	ability to maintain hoisting and lifting equipment
1.04.07	ability to recognize worn, damaged or defective hoisting and lifting equipment

Sub-task

1.05 Uses welding/cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

1.05.01	knowledge of types of welding/cutting equipment such as oxy-acetylene (OAW) and MIG gas metal arc welding (GMAW)

1.05.02	knowledge of welding materials such as wire and shield gases
1.05.03	knowledge of welding principles and considerations
1.05.04	ability to identify material to be welded
1.05.05	ability to perform welding and cutting procedures
1.05.06	ability to organize welding/cutting equipment
1.05.07	ability to maintain welding/cutting equipment
1.05.08	ability to store welding/cutting equipment
1.05.09	ability to recognize worn, damaged or defective welding/cutting equipment and potential hazards

Sub-task

1.06 Uses safety equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

1.06.01	knowledge of types of safety equipment such as respiratory, hearing, eye and body protection
1.06.02	knowledge of safety equipment operations
1.06.03	knowledge of workplace safety and health regulations
1.06.04	knowledge of location of safety equipment
1.06.05	ability to inspect and maintain safety equipment
1.06.06	ability to store safety equipment
1.06.07	ability to recognize worksite hazards

Sub-task

1.07 Uses shop equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

1.07.01	knowledge of types of shop equipment such as electric, pneumatic and hydraulic
1.07.02	knowledge of shop computer applications
1.07.03	knowledge of operating procedures
1.07.04	ability to apply hand/eye coordination
1.07.05	ability to organize shop equipment
1.07.06	ability to maintain shop equipment
1.07.07	ability to store shop equipment
1.07.08	ability to recognize worn, damaged or defective shop equipment

Task 2 Organizes work.

Sub-task

2.01 Communicates with others.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

2.01.01	knowledge of technical terminology
2.01.02	knowledge of government and company policies and procedures, guidelines and standards
2.01.03	knowledge of verbal and written communication
2.01.04	ability to use communication equipment and media such as Internet, email and fax

2.01.05	ability to translate technical information into layperson's terms
2.01.06	ability to acquire information through questioning
2.01.07	ability to communicate with other related professionals such as partspersons and supervisors
2.01.08	ability to communicate with customers

Sub-task

2.02 Uses technical information. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

2.02.01	knowledge of types of technical information such as work orders, shop manuals, schematics and technical service bulletins (TSB)
2.02.02	knowledge of formats of information such as print and electronic
2.02.03	knowledge of automobile construction and repair procedures
2.02.04	ability to acquire service and repair information
2.02.05	ability to interpret information received
2.02.06	ability to organize and prioritize information
2.02.07	ability to locate vehicle specific information such as vehicle, axle and transmission identification numbers on the vehicle
2.02.08	ability to access information using manufacturers' identification codes such as vehicle identification number (VIN), paint and trim codes and calibration numbers

Sub-task

2.03 Maintains safe work environment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

2.03.01	knowledge of Workplace Hazardous Materials Information System (WHMIS)
2.03.02	knowledge of types and operation of fire extinguisher equipment
2.03.03	knowledge of on-site first aid stations
2.03.04	knowledge of disposal and recycling procedures
2.03.05	ability to recognize potential hazards
2.03.06	ability to handle and store hazardous materials

Sub-task

2.04 Estimates job cost.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	no	NV	yes	yes	yes	yes	yes	yes	yes	NV

2.04.01	knowledge of vehicle construction and components
2.04.02	knowledge of regulations regarding consumer estimates
2.04.03	knowledge of industry standard labour guides
2.04.04	ability to use information provided by the inspection or diagnostic procedures to estimate parts and labour required
2.04.05	ability to use industry standard labour guides

2.04.06	ability to perform related mathematical calculations
2.04.07	ability to select parts required to perform repair

Task 3 Performs general maintenance and diagnosis.

Sub-task

3.01 Maintains vehicle to specifications.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

3.01.01	knowledge of lubricants and fluids
3.01.02	knowledge of causes of tire wear such as over-inflation, under-inflation and worn suspension components
3.01.03	ability to access manufacturers' maintenance schedules and specifications
3.01.04	ability to change filters such as fuel, air, and oil filters
3.01.05	ability to rotate tires
3.01.06	ability to exchange fluids such as transmission, coolant and brake fluid
3.01.07	ability to dispose of fluids according to environmental regulations
3.01.08	ability to replace components such as spark plugs, transmission filters, brake linings and positive crankcase ventilation (PCV) valves at specified intervals

Sub-task

3.02 Inspects for potential problems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

3.02.01	knowledge of common wear points such as brake lining, tire tread, ball joints and wiper blades
3.02.02	ability to evaluate condition of components such as tires, brakes, steering and suspension against manufacturers' specifications
3.02.03	ability to recognize worn, damaged or defective components such as belts, hoses, u-joints and exhaust pipes

Sub-task

3.03 Performs diagnostic procedures.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

3.03.01	knowledge of expected operation
3.03.02	knowledge of test procedures such as road test and operational checks
3.03.03	ability to verify vehicle symptom
3.03.04	ability to identify faulty system
3.03.05	ability to identify faulty components
3.03.06	ability to isolate cause of faults
3.03.07	ability to access all relevant and available service data such as TSB, recalls and service history information

BLOCK B

ENGINE SYSTEMS

Trends:

Advances in engine design such as variable cam timing, displacement on demand, variable manifold runners. Engines and support systems have become considerably lighter using new materials such as composites, aluminium and plastic. More variation in cooling and lubrication systems and fluids (oil, coolant, synthetics). More efficient engines needing less fuel and providing more power.

Related Components:

Cooling system: water pump, thermostat, expansion tanks, reservoir, belts, hoses, fan, radiator, radiator cap, heater core, clamps, temperature senders, gauges, warning indicators.

Lubricating system: oil pumps, filters, hoses, lines, pickup screens, sump, coolers, level indicators, senders, gauges, warning indicators.

Base engine: cylinder block, bearings, crankshaft, connecting rods, pistons, piston rings, camshafts, valve trains, cylinder heads, cam timing components, flywheels, balance shafts, gaskets, seals, mounts.

Fuel delivery system (gasoline, diesel and alternative fuels): fuel pump, lines, regulators, tanks, filters, gauges, senders, fuel injectors, diesel injector pump, lift pump, fuel lock offs, mixers, fuel storage cylinders.

Ignition system: distributor, cap and rotor, coil, spark plugs, spark plug wires, primary ignition trigger.

Intake/exhaust system: upper and lower intake manifolds, ducting, air cleaners, throttle plates or bodies, crankcase breathers, exhaust manifolds, heat riser, pipes, mufflers, catalytic converters, turbo/super chargers, exhaust back pressure devices, mounting hardware.

Emission system: catalytic converter, PCV, O_2 sensors, exhaust gas EGR, vacuum pump, EVAP systems, closed loop fuel injection system, secondary air pump system.

Accessory drive system and mounting components: belts, pulleys, tensioners, idlers, brackets, braces, hangers, bearings, mounts.

Tools and Equipment:

See Appendix A.

Task 4 Diagnoses engine systems.

Sub-task

4.01 Diagnoses cooling systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

Supporting Knowledge & Abilities

4.01.01	knowledge of types of cooling systems such as liquid and air cooled
4.01.02	knowledge of cooling system components such as gaskets, thermostats and water pumps
4.01.03	knowledge of warning systems such as lights, gauges and switches
4.01.04	knowledge of fan systems such as mechanical, electric and hydraulic
4.01.05	knowledge of types of coolants and chemical additives
4.01.06	knowledge of related systems such as heating, ventilation and air conditioning (HVAC) and auxiliary coolers
4.01.07	ability to pressurize cooling and pressure regulating devices such as radiator pressure cap
4.01.08	ability to analyze coolant flow
4.01.09	ability to identify restrictions
4.01.10	ability to verify thermostat operation
4.01.11	ability to identify worn, damaged or defective components such as radiators, hoses and belts
4.01.12	ability to analyze coolant properties such as freeze protection, chemistry and contamination
4.01.13	ability to identify air flow problems

Sub-task

4.02 Diagnoses lubricating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

4.02.01	knowledge of composition of lubricants such as grades of oil, synthetics and additives
4.02.02	knowledge of types of oil pumps and drives such as gerotor, vane type and gear type
4.02.03	knowledge of oil coolers such as oil-to-air and oil-to-coolant
4.02.04	knowledge of oil flow and filtration methods
4.02.05	knowledge of gaskets, seals and sealants
4.02.06	knowledge of warning systems such as lights, gauges and switches
4.02.07	ability to perform oil pressure tests
4.02.08	ability to recognize failed gaskets and seals using leak detection methods such as black light and dye

Sub-task

4.03 Diagnoses base engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

4.03.01	knowledge of types of engine configurations such as inline, rotary, opposed and V
4.03.02	knowledge of types of valve train configurations such as push rod, overhead cam and multi-valve
4.03.03	knowledge of engine timing components such as timing belts, chains and gear drive

4.03.04	knowledge of engine component clearances and specifications
4.03.05	ability to interpret results of tests such as compression, leak down, vacuum and head gasket tests
4.03.06	ability to calculate engine displacement, compression ratios, horsepower, area and volume
4.03.07	ability to identify sources of specific engine noises such as crankshaft, valve train, piston and timing chain noise
4.03.08	ability to recognize worn, damaged or defective engine components
4.03.09	ability to recognize base engine related driveability concerns such as low power, smoke, oil consumption and rough running
4.03.10	ability to verify valve timing and valve adjustment

Task 5 Repairs engine systems.

Sub-task

5.01 Repairs cooling systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

5.01.01	knowledge of types of coolants and chemical additives
5.01.02	knowledge of cooling system components such as gaskets, thermostats and water pumps
5.01.03	knowledge of fan systems such as mechanical, electric or hydraulic
5.01.04	knowledge of types of cooling systems such as liquid and air cooled

5.01.05	knowledge of related systems such as HVAC and auxiliary coolers
5.01.06	knowledge of water quality suitable for cooling systems
5.01.07	ability to follow manufacturers' specifications and recommendations
5.01.08	ability to remove and replace cooling system components such as water pumps, thermostats and radiators
5.01.09	ability to flush coolants
5.01.10	ability to bleed systems
5.01.11	ability to verify repair
5.01.12	ability to recycle or dispose of coolants according to environmental regulations

Sub-task

5.02 Repairs lubricating systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

5.02.01	knowledge of gaskets, seals and sealants
5.02.02	knowledge of types of oil pumps and drives such as gerotor, vane type and gear type
5.02.03	ability to remove and replace lubricating system components such as gaskets, seals, oil pumps and oil pan
5.02.04	ability to follow manufacturers' specifications and recommendations
5.02.05	ability to select specified sealants
5.02.06	ability to select specified lubricants
5.02.07	ability to perform maintenance procedures such as oil and filter changes

5.02.08	ability to verify repair
5.02.09	ability to dispose of lubricants according to environmental regulations

Sub-task

5.03 Repairs base engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

5.03.01	knowledge of types of engine configurations such as inline, rotary, opposed and V
5.03.02	knowledge of types of valve train configurations such as push rod, overhead cam and multi-valve
5.03.03	knowledge of engine timing components such as timing belts, chains and gear drive
5.03.04	knowledge of engine component clearances and specifications
5.03.05	knowledge of engine hoisting and repair fixture mounting
5.03.06	ability to follow manufacturers' specifications and recommendations
5.03.07	ability to measure and adjust engine component clearances
5.03.08	ability to replace engine components
5.03.09	ability to follow engine assembly and disassembly procedures such as torque sequences and surface preparation for part or component re-installation
5.03.10	ability to remove and reinstall engine
5.03.11	ability to verify valve timing and valve adjustment
5.03.12	ability to verify repair

Task 6 Diagnoses engine support systems.

Sub-task

6.01 Diagnoses fuel delivery systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

6.01.01	knowledge of types of fuel delivery systems
6.01.02	knowledge of types of fuel such as gasoline, diesel and alternate fuels
6.01.03	knowledge of fuel handling and storage procedures
6.01.04	knowledge of types of gasoline fuel injection systems
6.01.05	knowledge of types of diesel fuel injection systems
6.01.06	knowledge of alternate fuel systems
6.01.07	knowledge of carburetion
6.01.08	ability to perform tests such as pressure, volume and fuel quality
6.01.09	ability to isolate fuel system problems

Sub-task

6.02 Diagnoses ignition systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

6.02.01	knowledge of types of ignition systems such as distributor, distributorless and electronic
6.02.02	knowledge of ignition system components such as wires, coils, spark plugs and distributors

6.02.03	knowledge of electronic circuits
6.02.04	ability to perform ignition measurements such as coil over plug, coil output, spark duration, wire resistance and leakage
6.02.05	ability to identify worn, damaged or defective components

Sub-task

6.03 Diagnoses intake/exhaust systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

6.03.01	knowledge of types of intake/exhaust systems
6.03.02	knowledge of intake air flow control systems and components
6.03.03	knowledge of exhaust components such as catalytic converters, heat risers, valves and mufflers
6.03.04	knowledge of composition of intake/exhaust systems
6.03.05	ability to identify leaks or blockages in intake/exhaust systems
6.03.06	ability to perform tests on super/turbo chargers such as boost test, shaft and bearing play

Sub-task

6.04 Diagnoses emission systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

6.04.01	knowledge of types of emission gases such as CO, CO_2, NO, and HC

6.04.02	knowledge of types of control devices such as exhaust gas recirculation (EGR), evaporative emission control systems (EVAP) and secondary air injection
6.04.03	knowledge of industry standard On Board Diagnostics systems such as OBD I and OBD II
6.04.04	ability to test emission control devices such as EGR, EVAP and PCV
6.04.05	ability to test catalytic converters
6.04.06	ability to interpret information such as OBD I and OBD II diagnostic codes and data

Sub-task

6.05 Diagnoses accessory drive systems and mounts.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

6.05.01	knowledge of types of belt drive systems
6.05.02	knowledge of types of belt tensioners
6.05.03	knowledge of engine transmission and exhaust mounts
6.05.04	ability to check accessory drive pulley alignment
6.05.05	ability to identify cause of noise and vibration
6.05.06	ability to measure belt tension

Task 7 Repairs engine support systems.

Sub-task

7.01 Repairs fuel delivery systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

7.01.01	knowledge of types of fuel delivery systems
7.01.02	knowledge of types of fuel such as gasoline, diesel and alternate fuels
7.01.03	knowledge of fuel handling and storage procedures
7.01.04	knowledge of types of gasoline fuel injection systems
7.01.05	knowledge of types of diesel fuel injection systems
7.01.06	knowledge of alternate fuel systems
7.01.07	knowledge of carburetion
7.01.08	knowledge of jurisdictional regulations
7.01.09	ability to follow manufacturers' specifications and recommendations
7.01.10	ability to remove and replace fuel delivery components
7.01.11	ability to depressurize fuel systems and recover fuel
7.01.12	ability to change fuel filters
7.01.13	ability to adjust carburetion settings
7.01.14	ability to adjust diesel injection timing
7.01.15	ability to bleed diesel systems
7.01.16	ability to verify repairs using scan tools to analyse data such as OBD II monitors

Sub-task

7.02 Repairs ignition systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

7.02.01	knowledge of types of ignition systems such as distributor, distributorless and electronic
7.02.02	knowledge of ignition system components such as wires, coils, spark plugs and distributors
7.02.03	knowledge of electronic circuits
7.02.04	ability to adjust ignition systems to specifications such as ignition timing and spark plug gap
7.02.05	ability to remove and replace ignition components
7.02.06	ability to verify repairs using scan tools to analyse data such as OBD II monitors

Sub-task

7.03 Repairs intake/exhaust systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

7.03.01	knowledge of types of intake/exhaust systems
7.03.02	knowledge of intake air flow control systems and components
7.03.03	knowledge of exhaust components such as catalytic converters, heat risers, valves and mufflers
7.03.04	knowledge of composition of intake/exhaust systems
7.03.05	ability to follow manufacturers' specifications and recommendations

7.03.06	ability to maintain intake systems such as cleaning throttle valve, servicing mass airflow sensors and replacing air filter
7.03.07	ability to select gaskets, seals and sealants
7.03.08	ability to service super/turbo chargers using procedures such as oil changes and decarbonizing
7.03.09	ability to remove and replace worn, damaged or defective components
7.03.10	ability to verify repairs using scan tools to analyse data such as OBD II monitors

Sub-task

7.04 Repairs emission systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

7.04.01	knowledge of types of emission gases such as CO, CO_2, NO_x and HC
7.04.02	knowledge of types of control devices such as EGR, EVAP and secondary air injection
7.04.03	knowledge of industry standard On Board Diagnostics systems such as OBD II
7.04.04	ability to follow manufacturers' specifications and recommendations
7.04.05	ability to remove and replace emission control devices
7.04.06	ability to verify repairs using scan tools to analyze data such as OBD II monitors

Sub-task

7.05 Repairs accessory drive systems and mounts.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

Supporting Knowledge & Abilities

7.05.01	knowledge of types of belt drive systems
7.05.02	knowledge of types of belt tensioners
7.05.03	knowledge of engine transmission and exhaust mounts
7.05.04	ability to follow manufacturers' specifications and recommendations
7.05.05	ability to remove and replace mounting components
7.05.06	ability to remove and replace accessory drive belt components such as pulleys, bearings and tensioners
7.05.07	ability to adjust and neutralize mounts
7.05.08	ability to adjust pulley alignment

BLOCK C

VEHICLE MANAGEMENT SYSTEMS

Trends: *Increased use of modules and networking resulting in more shared information. Increased use of non-direct linked systems such as drive-by wire systems. More modules have self-diagnostic capabilities. Reduction in the size and number of wires.*

Related Components: Wiring, connectors, modules, input and output devices.

Tools and Equipment: Standard tool kit, safety and personal protection equipment, scan tools, break out boxes, anti-static devices.

Task 8 Diagnoses vehicle management systems.

Sub-task

8.01 Reads diagnostic codes.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

8.01.01 knowledge of diagnostic code types and formats such as OBD I and OBD II industry standards

8.01.02 knowledge of types of networks such as International Standards Organization (ISO), high speed (HS), controller area network (CAN), air conditioning pressure (ACP) and universal asynchronous receive transmit (UART)

8.01.03 knowledge of diagnostic code protocols and actions

8.01.04 knowledge of operation and interrelationship of modules

8.01.05 ability to access information on code using CD, Internet and print information

8.01.06 ability to interpret diagnostic codes

Sub-task

8.02 Monitors parameters.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

8.02.01	knowledge of types of parameters such as revolutions per minute (RPM), throttle position (TPS) and vehicle speed sensor (VSS)
8.02.02	knowledge of relationship of various parameters
8.02.03	ability to select and organize relevant parameters

Sub-task

8.03 Interprets test results.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

8.03.01	knowledge of parameter definitions
8.03.02	ability to access service information
8.03.03	ability to compare parameter values to vehicle specifications

Sub-task

8.04 Tests components and system circuitry.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

8.04.01	knowledge of network circuitry types
8.04.02	knowledge of inputs modules and outputs

8.04.03	ability to test network circuitry
8.04.04	ability to use testing equipment such as DVOM, jumper wires, test probes and break out boxes

Task 9 Repairs vehicle management systems.

Sub-task

9.01 Reprograms component software.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

9.01.01	knowledge of methods of software transfer
9.01.02	knowledge of basic computer processes
9.01.03	ability to select software
9.01.04	ability to interpret calibrations
9.01.05	ability to transfer/access software using methods such as CD, Internet and programmable read only memory (PROM) replacement

Sub-task

9.02 Replaces components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

9.02.01	knowledge of types of components such as control module, wire harnesses, input and output devices
9.02.02	knowledge of replacement procedures such as transfer of PROM

9.02.03	ability to reconfigure modules
9.02.04	ability to locate components using service information
9.02.05	ability to follow vehicle-specific cautionary procedures such as using anti-static strap and disabling restraint systems

Sub-task

9.03 Repairs electrical connections and wiring.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

9.03.01	knowledge of circuit orientation such as twisted pair and shielded wire
9.03.02	knowledge of types of wiring procedures such as soldering and crimping
9.03.03	ability to interpret wiring diagrams
9.03.04	ability to select terminals
9.03.05	ability to select and use tools such as soldering tools, crimping tools and terminal removal tools

Sub-task

9.04 Verifies repair using drive cycles.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

9.04.01	knowledge of drive cycles using OBD II monitors
9.04.02	knowledge of methods of verifying repair such as clear codes, retest and road test using drive cycles

9.04.03	ability to use scan tools to reset system and compare parameters
9.04.04	ability to road test to verify repair
9.04.05	ability to select test environment

BLOCK D

DRIVE LINE SYSTEMS

Trends: *Increase in electronically-controlled systems. Increase in specialization of transmission/transaxles diagnosis and repair. Increase in selection of gear ranges and variable transmissions. Increased use of safety interlock systems.*

Related Components: Mounts, brackets, linkages, cables, hydraulic lines, coolers, VSS, flex plates, ring gear, torque converters, solenoids, actuators, sensors, switches, heat shields, seals, wheels and tires, wiring harnesses, vacuum lines, vibration dampers, shifters, flywheels, transmissions, transaxles, transfer cases, clutches, drive shafts, differentials.

Tools and Equipment: Standard tool kit, safety and personal protection equipment, hoisting and lifting equipment, scan tools, pullers, presses, pressure gauges, spreaders, clutch alignment tools, installers and removers, flushing and bleeding equipment, acetylene torches, parts washers/steam cleaners, hydraulic transmission jack, jack stands and supports, engine and transmission supports, chassis ears, electronic vibration analyzer, transmission fixtures.

Task 10 Diagnoses drive line systems.

Sub-task

10.01 Diagnoses drive shafts and axles.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

10.01.01 knowledge of drive shaft types and construction such as single, two piece and steel, aluminium and composite construction

10.01.02 knowledge of types of drive shaft components such as slip yoke, flex, single and double cardan joints

10.01.03 knowledge of types of axles such as CV axles, solid axles, floating and semi-floating

10.01.04 knowledge of multiple piece drive shaft phasing/indexing

10.01.05 knowledge of safety precautions

10.01.06	ability to follow diagnostic flow chart
10.01.07	ability to identify worn, damaged or defective components
10.01.08	ability to remove and inspect related components
10.01.09	ability to use specialized measuring gauges
10.01.10	ability to measure drive line angles

Sub-task

10.02 Diagnoses manual transmissions/transaxles.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

10.02.01	knowledge of types of manual transmissions/transaxles
10.02.02	knowledge of path of power
10.02.03	knowledge of types of lubricants
10.02.04	ability to follow diagnostic flow chart
10.02.05	ability to calculate gear ratios
10.02.06	ability to road test to identify noises, vibrations, customer concerns and driveability
10.02.07	ability to check level and condition of lubricants
10.02.08	ability to detect leaks and damage
10.02.09	ability to use specialty tools such as leak detectors and stethoscope

Sub-task

10.03 Diagnoses automatic transmissions/transaxles.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

Supporting Knowledge & Abilities

10.03.01	knowledge of types of automatic transmissions/transaxles
10.03.02	knowledge of gear ratios
10.03.03	knowledge of path of power
10.03.04	knowledge of lubricants
10.03.05	knowledge of transmission cooling systems
10.03.06	knowledge of control systems
10.03.07	knowledge of fluid drive systems such as pumps, valves, filters and torque converters
10.03.08	knowledge of mechanical drive systems such as clutch packs, shafts and planetary gear sets
10.03.09	ability to follow diagnostic flow chart
10.03.10	ability to road test to identify noises, vibrations, customer concerns and driveability
10.03.11	ability to interpret diagnostic codes
10.03.12	ability to perform hydraulic pressure test
10.03.13	ability to test transmission cooler operation and transmission lines
10.03.14	ability to check fluid levels and condition
10.03.15	ability to check for leaks, inspect for damage and test components
10.03.16	ability to use specialty tools such as scan tools, pressure gauges and stethoscopes
10.03.17	ability to follow fluid flow charts

Sub-task

10.04 Diagnoses clutches.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

10.04.01	knowledge of types of clutches/flywheels
10.04.02	knowledge of hydraulics/linkage systems
10.04.03	ability to follow diagnostic flow chart
10.04.04	ability to road test to detect slippage, chatter, noises and vibration
10.04.05	ability to detect leaks and damage
10.04.06	ability to detect clutch contamination
10.04.07	ability to test clutch safety switch operation
10.04.08	ability to check throw-out release bearings

Sub-task

10.05 Diagnoses transfer cases.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

10.05.01	knowledge of types of transfer cases such as active and passive
10.05.02	knowledge of control systems such as vacuum, manual and electronic
10.05.03	knowledge of types of fluids
10.05.04	knowledge of path of power
10.05.05	ability to follow diagnostic flow chart
10.05.06	ability to road test for operation, noises and vibration
10.05.07	ability to inspect fluid levels and conditions

	10.05.08	ability to check for leaks, inspect for damage and test components
	10.05.09	ability to interpret diagnostic codes

Sub-task

10.06 Diagnoses differentials.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

	10.06.01	knowledge of types of differentials such as integral, removable and locking
	10.06.02	knowledge of types of axles such as full-floating and semi-floating
	10.06.03	knowledge of types of lubricants and additives
	10.06.04	knowledge of path of power
	10.06.05	knowledge of control systems
	10.06.06	knowledge of limited slip differentials
	10.06.07	ability to follow diagnostic flow chart
	10.06.08	ability to road test for driveability to detect noise, vibration and slippage
	10.06.09	ability to detect leaks and damage
	10.06.10	ability to inspect fluid levels and conditions

Task 11 Repairs drive line systems.

Sub-task

11.01 Repairs drive shafts and axles.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

Supporting Knowledge & Abilities

11.01.01	knowledge of drive shaft types and construction such as single, two piece and steel, aluminium and composite construction
11.01.02	knowledge of types of drive shaft components such as slip yoke, flex, single and double cardan joints
11.01.03	knowledge of types of axles such as CV axles, solid axles, floating and semi-floating
11.01.04	knowledge of safety precautions
11.01.05	ability to follow manufacturers' specifications and recommendations
11.01.06	ability to remove, replace or recondition drive shaft components
11.01.07	ability to lubricate components
11.01.08	ability to use specialty tools such as angle gauges and presses
11.01.09	ability to index components
11.01.10	ability to align and balance components
11.01.11	ability to identify worn, damaged or defective components
11.01.12	ability to road test to verify repair

Sub-task

11.02 Repairs manual transmissions/transaxles.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

11.02.01	knowledge of types of manual transmissions/transaxles
11.02.02	knowledge of gear ratios
11.02.03	knowledge of path of power
11.02.04	knowledge of lubricants
11.02.05	ability to follow manufacturers' specifications and recommendations
11.02.06	ability to remove, replace or recondition assemblies
11.02.07	ability to replace worn, damaged or defective assembly components
11.02.08	ability to use specialty tools such as pullers, presses and gauges
11.02.09	ability to perform adjustments to components such as linkages and shifters
11.02.10	ability to replace VSS
11.02.11	ability to road test to verify repair

Sub-task

11.03 Repairs automatic transmissions/transaxles.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

11.03.01	knowledge of types of automatic transmissions/transax[1]es

11.03.02	knowledge of gear ratios
11.03.03	knowledge of lubricants
11.03.04	knowledge of control systems
11.03.05	knowledge of fluid drive systems
11.03.06	knowledge of mechanical drive systems
11.03.07	ability to follow manufacturers' specifications and recommendations
11.03.08	ability to remove, replace or recondition assemblies
11.03.09	ability to replace worn, damaged or defective assembly components
11.03.10	ability to use specialized tools such as pullers, compressors, installers, scan tools and DVOM
11.03.11	ability to perform adjustments and measurements
11.03.12	ability to follow fluid flow charts
11.03.13	ability to replace electronic components such as solenoids, wiring and sensors
11.03.14	ability to road test to verify repair

Sub-task

11.04 Repairs clutches.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

11.04.01	knowledge of types of clutches/flywheels
11.04.02	knowledge of hydraulics/linkage systems
11.04.03	knowledge of clutch operation
11.04.04	ability to follow manufacturers' specifications and recommendations

11.04.05	ability to remove and replace clutch assembly and related components
11.04.06	ability to replace or refinish flywheel
11.04.07	ability to perform adjustments such as clutch linkage free play
11.04.08	ability to replace hydraulic components
11.04.09	ability to bleed hydraulic systems
11.04.10	ability to road test to verify repair

Sub-task

11.05 Repairs transfer cases.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

11.05.01	knowledge of types of transfer cases such as active and passive
11.05.02	knowledge of control systems such as vacuum, manual and electronic
11.05.03	knowledge of types of fluids
11.05.04	knowledge of path of power
11.05.05	knowledge of transfer case operation
11.05.06	ability to follow manufacturers' specifications and recommendations
11.05.07	ability to remove, replace or recondition transfer case assemblies
11.05.08	ability to replace worn, damaged or defective assembly components
11.05.09	ability to use specialty tools such as pullers, compressors and DVOM
11.05.10	ability to road test to verify repair

Sub-task

11.06 Repairs differentials.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

Supporting Knowledge & Abilities

11.06.01	knowledge of types of differentials such as integral and removable
11.06.02	knowledge of types of axles such as full floating and semi-floating
11.06.03	knowledge of types of lubricants and additives
11.06.04	knowledge of path of power
11.06.05	knowledge of control systems
11.06.06	knowledge of limited slip differentials
11.06.07	ability to follow manufacturers' specifications and recommendations
11.06.08	ability to remove, replace or recondition differential assemblies
11.06.09	ability to replace worn, damaged or defective assembly components
11.06.10	ability to use specialty tools such as pullers, presses, gauges, spreaders and dial indicators
11.06.11	ability to perform adjustments such as gear tooth contact pattern, pinion depth and backlash
11.06.12	ability to road test to verify repair

BLOCK E

ELECTRICAL AND COMFORT CONTROL SYSTEMS

Trends: *Increased use of non-repairable electrical components and lighter weight materials. Increase in the number of consumer controlled features and increase in the personalization of the vehicle. Increase in comfort features including heated and cooled seats and heated mirrors and glass. Increased use of hybrid technology will change the approaches to diagnostics and repair of starting assist and braking systems.*

Related Components: Batteries, alternators, starters, base wiring, switches, sensors, actuators, modules, solenoids, linkages, motors, light bulbs, receivers, transmitters, heaters, relays, thermostats, hoses, pumps, nozzles, valves, mirrors, glass, displays, gauges, clusters, compressors, pipes, evaporators, condensers, accumulators, restrictors, remote starters, brake controllers, vacuum lines and reservoirs, check valves, fuses and fuse links, heater cores, connectors, terminals, fans, resistors, controllers, filters, entertainment unit.

Tools and Equipment: Standard tool kit, safety and personal protection equipment, scan tools, break out boxes, battery chargers/boosting equipment, AVR, air conditioning recovery/recycle/recharge station, headlight aiming equipment, air conditioning leak detection and inspection equipment, black light.

Task 12 Diagnoses electrical systems and components.

Sub-task

12.01 Diagnoses starting/charging systems and batteries.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

12.01.01	knowledge of types and operation of starting systems
12.01.02	knowledge of types and operation of charging systems
12.01.03	knowledge of types of batteries such as lead acid, gel and sealed
12.01.04	ability to test starting and charging systems and batteries

Sub-task

12.02 Diagnoses basic wiring and electrical systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

Supporting Knowledge & Abilities

12.02.01	knowledge of basic wiring principles
12.02.02	knowledge of electrical principles such as Ohm's law and electron theory
12.02.03	knowledge of general electrical components such as fuses, ignition switches, relays and circuit breakers
12.02.04	knowledge of wire characteristics such as gauge, size and insulation
12.02.05	ability to test circuits using equipment such as scan tools, test lights and DVOM
12.02.06	ability to interpret wiring diagrams
12.02.07	ability to probe circuitry

Sub-task

12.03 Diagnoses lighting and wiper systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

Supporting Knowledge & Abilities

12.03.01	knowledge of types and operation of lighting systems and components
12.03.02	knowledge of types and operation of wiper systems and components
12.03.03	ability to interpret wiring diagrams
12.03.04	ability to perform Ohm's law calculations
12.03.05	ability to use testing equipment

12.03.06	ability to interpret diagnostic codes
12.03.07	ability to inspect mechanical components such as linkages and wipers

Sub-task

12.04 Diagnoses entertainment systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	no	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

12.04.01	knowledge of types and operation of entertainment systems such as audio and video
12.04.02	knowledge of system components such as displays, speakers and power antennae
12.04.03	knowledge of service considerations such as temperature and location of components
12.04.04	ability to activate system self-diagnosis function
12.04.05	ability to check system integrity such as power, ground and wire continuity
12.04.06	ability to identify faulty components

Sub-task

12.05 Diagnoses electrical options.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

12.05.01	knowledge of types and operation of options such as power windows, parking aids, keyless entry, power seats and theft deterrents
12.05.02	knowledge of special service considerations such as paint on sensors and paint on air bag covers

12.05.03	ability to use test equipment
12.05.04	ability to perform basic circuit analysis
12.05.05	ability to interpret wiring diagrams
12.05.06	ability to interpret diagnostic codes

Sub-task

12.06 Diagnoses electrical accessories.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

12.06.01	knowledge of types of electrical accessories such as remote starters, brake controllers, trailer wiring and navigation systems
12.06.02	ability to use test equipment
12.06.03	ability to interpret wiring diagrams
12.06.04	ability to interpret diagnostic codes
12.06.05	ability to determine compatibility of electrical accessories

Sub-task

12.07 Diagnoses instrumentation and information displays.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

12.07.01	knowledge of types and operation of instrumentation systems such as gauges, speedometers and tachometers
12.07.02	knowledge of types and operation of displays such as temperature, compasses and engine monitoring
12.07.03	ability to interpret wiring diagrams

12.07.04	ability to use test equipment
12.07.05	ability to interpret integrated diagnostic information

Task 13 Repairs electrical systems and components.

Sub-task

13.01 Repairs starting/charging systems and batteries.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

13.01.01	knowledge of types and operation of starting systems
13.01.02	knowledge of types and operation of charging systems
13.01.03	knowledge of types of batteries such as lead acid, gel and sealed
13.01.04	ability to follow manufacturers' specifications and recommendations
13.01.05	ability to determine component serviceability using methods such as costs of repair versus replacement
13.01.06	ability to remove and replace components

Sub-task

13.02 Repairs basic wiring and electrical systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

13.02.01	knowledge of basic wiring principles such as Ohm's law and electron theory

13.02.02	knowledge of wire characteristics such as gauge, size and insulation
13.02.03	ability to follow manufacturers' specifications and recommendations
13.02.04	ability to repair circuitry using methods such as splicing, terminal replacement, soldering and crimping
13.02.05	ability to replace damaged components such as harnesses, connectors, relays and fusible links

Sub-task

13.03 Repairs lighting and wiper systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

13.03.01	knowledge of types and operation of lighting systems
13.03.02	knowledge of types and operation of wiper systems
13.03.03	knowledge of service procedures for bulbs
13.03.04	knowledge of governmental regulations regarding lighting
13.03.05	ability to follow manufacturers' specifications and recommendations
13.03.06	ability to adjust and replace wiper components such as linkages and controls
13.03.07	ability to aim headlights
13.03.08	ability to replace lighting components

Sub-task

13.04 Repairs entertainment systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	no	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

13.04.01	knowledge of types and operation of entertainment systems such as audio and video
13.04.02	knowledge of components of entertainment systems
13.04.03	knowledge of service considerations such as temperature and location of components
13.04.04	knowledge of anti-theft features
13.04.05	ability to follow manufacturers' specifications and recommendations
13.04.06	ability to replace components such as receivers, speakers, amplifiers and equalizers
13.04.07	ability to determine technician service limitations

Sub-task

13.05 Repairs electrical options.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

13.05.01	knowledge of types and operation of electrical options such as sensors, programmable keys and key fobs
13.05.02	knowledge of repair procedures such as calibration and configuration
13.05.03	knowledge of special service considerations such as paint on sensors and paint on air bag covers

13.05.04	ability to follow manufacturers' specifications and recommendations
13.05.05	ability to adjust sensors
13.05.06	ability to replace components such as motor, tracks and switches

Sub-task

13.06 Repairs electrical accessories. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

13.06.01	knowledge of types of electrical accessories such as remote starters, brake controllers, trailer wiring and navigation systems
13.06.02	ability to follow manufacturers' specifications and recommendations
13.06.03	ability to interpret wiring diagrams and diagnostic codes
13.06.04	ability to repair wiring

Sub-task

13.07 Installs electrical accessories. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

13.07.01	knowledge of requirements for accessories such as bracing, additional wiring and heavy duty flashers
13.07.02	knowledge of regulations
13.07.03	ability to follow manufacturers' specifications and recommendations

13.07.04	ability to determine suitability of accessory for vehicle
13.07.05	ability to reconfigure vehicle control module

Sub-task

13.08 Repairs instrumentation and information displays.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

13.08.01	knowledge of types and operation of instrumentation and displays
13.08.02	knowledge of legislation regarding odometer servicing
13.08.03	knowledge of safety concerns related to components such as gas tank, fuel gauge and airbags
13.08.04	knowledge of wiring, connectors and terminals
13.08.05	ability to follow manufacturers' specifications and recommendations
13.08.06	ability to replace components
13.08.07	ability to calibrate and configure instrumentation systems and displays

Task 14 Diagnoses HVAC and comfort control.

Sub-task

14.01 Diagnoses air flow control systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

14.01.01	knowledge of types and operation of air flow control systems such as manual, electrical and vacuum
14.01.02	knowledge of operation of components such as fans, blend doors, levers, actuators and auxiliary vacuum pumps
14.01.03	knowledge of causes of odours
14.01.04	ability to interpret diagrams and schematics
14.01.05	ability to use testing equipment such as scan tools and vacuum gauges
14.01.06	ability to perform function tests such as air flow direction, recirculation and temperature

Sub-task

14.02 Diagnoses refrigerant systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

14.02.01	knowledge of types and operation of refrigerant systems
14.02.02	knowledge of principles of refrigeration
14.02.03	knowledge of refrigerants, lubricants and consequences of improper mixing
14.02.04	knowledge of electronic control systems
14.02.05	ability to interpret pressure gauge readings

14.02.06	ability to use equipment to identify types of refrigerants
14.02.07	ability to use diagnostic testing methods such as dye and leak testing
14.02.08	ability to use test equipment such as scan tools and thermometer
14.02.09	ability to identify faulty components

Sub-task

14.03 Diagnoses heating systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

14.03.01	knowledge of types and operation of heating systems
14.03.02	knowledge of operation of components such as heater core, thermostats, coolant pumps and restrictors
14.03.03	knowledge of coolant types and characteristics
14.03.04	ability to perform function tests using methods such as output temperature or flow test
14.03.05	ability to test components such as vacuum and electric motors

Task 15 Repairs HVAC and comfort control.

Sub-task

15.01 Repairs air flow control systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

15.01.01	knowledge of types and operation of air flow control systems
15.01.02	knowledge of procedures to correct problems such as odours, air flow restrictions and noises
15.01.03	ability to follow manufacturers' specifications and recommendations
15.01.04	ability to access faulty components
15.01.05	ability to test vacuum systems
15.01.06	ability to repair or replace components such as vacuum lines and linkages
15.01.07	ability to access filtration devices such as pollen filters
15.01.08	ability to clean and deodorize air flow systems

Sub-task

15.02 Repairs refrigerant systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

15.02.01	knowledge of types and operation of refrigerant systems
15.02.02	knowledge of types and operation of components such as compressors, clutches and receiver dryers
15.02.03	knowledge of metering devices such as orifice tubes and expansion valves

15.02.04	knowledge of types of refrigerants and oils
15.02.05	knowledge of legislation regarding licensing requirements, use, handling and disposal of refrigerants
15.02.06	knowledge of electronic control systems
15.02.07	ability to follow manufacturers' specifications and recommendations
15.02.08	ability to evacuate and recharge systems
15.02.09	ability to store and recycle refrigerants
15.02.10	ability to convert systems to run on alternate refrigerants
15.02.11	ability to access faulty components

Sub-task

15.03 Repairs heating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

15.03.01	knowledge of types and operation of heating systems
15.03.02	knowledge of disposal requirements of coolants
15.03.03	knowledge of types of coolants and chemical additives
15.03.04	knowledge of water quality suitable for heating systems
15.03.05	ability to follow manufacturers' specifications and recommendations
15.03.06	ability to fill and bleed heating systems
15.03.07	ability to access and replace components such as heater core, thermostats and control valves

BLOCK F

STEERING, SUSPENSION, BRAKING AND CONTROL SYSTEMS

Trends: *Greater use of vehicle handling and control systems. Introduction into the market of run flat tires, different profiles and performance rated tires. Increase use of traction control, four wheel steering, all wheel drive and ride control systems. Introduction of electric steering.*

Related Components: **Steering system:** steering wheel, steering knuckle, steering column, mounts, control arms, linkages, steering boxes and racks, coolers, pumps, idler arms, pitman arms.

Suspension system: axles, cv shafts, universal joints, shocks, struts, springs, upper and lower control arms, torsion bars, sway bars, tires, wheels, hubs, wheel studs, valve stems, bearings, ball joints.

Braking system: rotors, drums, master cylinders, wheel cylinders and calipers, hoses, pipes, bushings, valves, power assist, springs, retainers, control modules, harnesses, sensors, actuators, ABS pump, modulators, brake linings, brake pads.

Tools and Equipment: Standard tool kit, safety and personal protection equipment, scan tools, pullers, presses, micrometers, wheel balancer, brake drum gauge, brake lathe, tire changing machine, tire repair equipment, wheel alignment equipment, leak detection equipment, hoisting and lifting equipment, ball joint press and adapters, coil spring compressor, flushing and bleeding equipment, pressure gauges.

Task 16 Diagnoses steering, suspension, braking and control systems.

Sub-task

16.01 Diagnoses steering and control systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

16.01.01 knowledge of types of steering systems such as rack-and-pinion, recirculating ball and power assist

16.01.02 knowledge of types of assist systems such as power, electric and hydraulic

16.01.03	knowledge of related components
16.01.04	knowledge of steering columns and their components such as tilt mechanism, steering locks and airbag clock spring
16.01.05	knowledge of control systems such as variable assist and four wheel steering
16.01.06	knowledge of safety concerns
16.01.07	knowledge of steering geometry
16.01.08	knowledge of types of pumps
16.01.09	ability to disarm air bag system
16.01.10	ability to select and use tools such as wheel alignment equipment and measuring tools
16.01.11	ability to identify cause of customer concern
16.01.12	ability to interpret diagnostic codes
16.01.13	ability to identify worn, damaged or defective steering components

Sub-task

16.02 Diagnoses suspension and control systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

16.02.01	knowledge of types of suspension systems such as independent, double wishbone and I-beam
16.02.02	knowledge of types of springs such as coil, leaf and torsion bar
16.02.03	knowledge of types of ride height controls such as airbags and air suspension
16.02.04	knowledge of types of dampers such as struts and shocks
16.02.05	knowledge of safety concerns

16.02.06	ability to perform jounce and rebound test
16.02.07	ability to interpret diagnostic codes
16.02.08	ability to select and use specialty tools such as scan tools, DVOM and gauges
16.02.09	ability to follow diagnostic flow chart
16.02.10	ability to measure ride height
16.02.11	ability to road test to verify complaint
16.02.12	ability to test control systems such as active suspension and stability control
16.02.13	ability to identify worn, damaged or defective components and subframes

Sub-task

16.03 Diagnoses braking and control systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

16.03.01	knowledge of types of braking systems
16.03.02	knowledge of types of control systems such as antilock braking systems (ABS) and traction control system (TCS)
16.03.03	knowledge of types of assist such as vacuum and hydraulic
16.03.04	knowledge of hydraulic principles such as Pascal's law
16.03.05	knowledge of fluid types
16.03.06	knowledge of safety concerns
16.03.07	ability to road test to identify and verify customer concerns
16.03.08	ability to inspect level and condition of fluids
16.03.09	ability to perform Pascal's law calculations

16.03.10	ability to use troubleshooting flow charts
16.03.11	ability to use specialty tools such as pressure gauges, DVOM and scan tools
16.03.12	ability to identify worn, damaged or defective components

Sub-task

16.04 Diagnoses tires, wheels, hubs and wheel bearings.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

16.04.01	knowledge of types of tires such as directional and conventional
16.04.02	knowledge of types of vehicle rims such as directional and conventional
16.04.03	knowledge of types of hubs
16.04.04	knowledge of types of wheel bearings
16.04.05	knowledge of relationship between suspension and components
16.04.06	knowledge of types of fluids and lubricants
16.04.07	ability to road test to verify customer concerns
16.04.08	ability to use specialty tools and equipment such as scan tools, wheel alignment machines, wheel balancer and tire machine
16.04.09	ability to identify tire wear patterns
16.04.10	ability to interpret tire codes and sidewall markings
16.04.11	ability to identify worn, damaged or defective components

Task 17 Repairs steering, suspension, braking and control systems.

Sub-task

17.01 Repairs steering and control systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

Supporting Knowledge & Abilities

17.01.01	knowledge of types of steering systems such as rack-and-pinion and recirculating ball
17.01.02	knowledge of types of assist systems such as power, electric and hydraulic
17.01.03	knowledge of related steering components such as tie rods, ball joints and pitman arms
17.01.04	knowledge of steering columns and components such as tilt mechanism, steering locks and airbag clock spring
17.01.05	knowledge of steering geometry
17.01.06	knowledge of hydraulics
17.01.07	knowledge of electrical theory
17.01.08	knowledge of types of pumps
17.01.09	ability to follow manufacturers' specifications and recommendations
17.01.10	ability to disarm airbag system
17.01.11	ability to use specialty tools such as scan tools, DVOM, pullers, presses and pressure gauges
17.01.12	ability to remove, replace and recondition steering system components
17.01.13	ability to road test to verify repair

Sub-task

17.02 Repairs suspension and *control systems.*

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

17.02.01	knowledge of types of suspension systems such as independent, double wishbone and I-beam
17.02.02	knowledge of types of springs such as coil, leaf and torsion bar
17.02.03	knowledge of types of ride height controls such as airbags and air suspension
17.02.04	knowledge of types of dampers such as struts and shocks
17.02.05	knowledge of safety concerns
17.02.06	ability to follow manufacturers' specifications and recommendations
17.02.07	ability to remove, replace or recondition suspension system components and subframes
17.02.08	ability to use specialty tools such as compressors, pullers, DVOM and scan tools
17.02.09	ability to perform wheel alignment
17.02.10	ability to road test to verify repair

Sub-task

17.03 Repairs braking and control systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

17.03.01	knowledge of types of braking systems

17.03.02	knowledge of types of control systems such as ABS and TCS
17.03.03	knowledge of types of assist such as vacuum and hydraulic
17.03.04	knowledge of hydraulic principles
17.03.05	knowledge of fluid types
17.03.06	knowledge of safety concerns
17.03.07	ability to follow manufacturers' specifications and recommendations
17.03.08	ability to inspect fluid level and condition
17.03.09	ability to remove, repair or recondition braking system components
17.03.10	ability to identify worn, damaged or defective components
17.03.11	ability to machine components such as drums and rotors on or off vehicle
17.03.12	ability to use specialty tools such as scan tools, brake lathes, bleeders and flaring tools
17.03.13	ability to flush and bleed hydraulic brakes
17.03.14	ability to handle and store brake fluid
17.03.15	ability to inspect, service and adjust brakes
17.03.16	ability to test and replace control modules and components
17.03.17	ability to inspect, test and replace assist components
17.03.18	ability to road test to verify repair
17.03.19	ability to inspect, service and repair parking brake systems

Sub-task

17.04 Repairs tires, wheels, hubs and wheel bearings.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

Supporting Knowledge & Abilities

17.04.01	knowledge of types of tires such as directional and conventional
17.04.02	knowledge of types of wheels such as directional and conventional
17.04.03	knowledge of types of hubs
17.04.04	knowledge of types of wheel bearings
17.04.05	knowledge of relationship between suspension and components
17.04.06	knowledge of types of fluids and lubricants
17.04.07	knowledge of types of tire repairs
17.04.08	ability to follow manufacturers' specifications and recommendations
17.04.09	ability to remove and repair tires
17.04.10	ability to identify worn, damaged or defective components
17.04.11	ability to remove, service or replace wheel bearings/seals
17.04.12	ability to follow safety procedures
17.04.13	ability to mount and dismount tires and wheels
17.04.14	ability to inflate and seal tires
17.04.15	ability to align and balance tires and wheels
17.04.16	ability to use specialty tools such as wheel balancers, scan tools and wheel alignment machines
17.04.17	ability to road test vehicle to verify repair

17.04.18 ability to interpret diagnostic codes

17.04.19 ability to measure axial and radial movement

BLOCK G

BODY COMPONENTS, TRIM AND RESTRAINT SYSTEMS

Trends: *Increased complexity in restraint systems (multiple airbag locations, seat belt pretensioners, weight sensitive, staged deployment). Increased adjustability of seats and pedals. Lighter weight components using materials such as composites, plastics and aluminium. More aerodynamic designs.*

Related Components: **Restraint systems:** seat belts, airbags, airbag diagnostic module, warning indicators, impact sensors.

Body components: seats, upholstery, adhesives, fasteners, latches, locks, regulators, weather stripping, glass channels, mirrors, bumpers, trim, hinges, antenna, fixed and movable glass, headlights, accessories such as trailer hitches, roof racks, running boards and box liners.

Tools and Equipment: Standard tool kit, safety and personal protection equipment, airbag removal tools, airbag simulators, chassis ears, electronic vibration analyzer, sirometer, water hose, smoke machine, upholstery tools.

Task 18 Diagnoses body components, trim and restraint systems.

Sub-task

18.01 Diagnoses active restraint systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

18.01.01 knowledge of seat belt mounting and operation

18.01.02 knowledge of seat belt warning system

18.01.03 ability to recognize seat belt defects such as burrs, frays and buckle malfunction

18.01.04 ability to test seat belt mechanisms such as tensioner locking

Sub-task

18.02 Diagnoses passive restraint systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

18.02.01	knowledge of types of passive restraint systems such as front impact airbags, curtain airbags and seat belt pretensioners
18.02.02	knowledge of airbag mounting, operation and locations
18.02.03	knowledge of impediments to proper air bag operation such as glass and trim items, seat covers and placement of child seats
18.02.04	knowledge of airbag monitoring systems
18.02.05	knowledge of progressive airbag deployment
18.02.06	ability to handle and remove airbag modules
18.02.07	ability to disarm and rearm airbag systems
18.02.08	ability to test airbag components
18.02.09	ability to access and interpret diagnostic codes

Sub-task

18.03 Diagnoses wind noise and water leaks.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	no	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

18.03.01	knowledge of seals, adhesives and sealing materials
18.03.02	knowledge of basic aerodynamics

18.03.03	ability to perform tests such as smoke tests, interior pressure tests and water leak tests
18.03.04	ability to use listening devices such as stethoscopes and electronic ears (engine and chassis)

Sub-task

18.04 Diagnoses NVH (noise, vibration, harshness).

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	no	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

18.04.01	knowledge of vibration emitters, conductors, generators and resonators
18.04.02	knowledge of basic aerodynamics
18.04.03	ability to isolate source of vibration using frequencies
18.04.04	ability to identify types of noises such as chuckles, rattles, knocks and whines, and their common sources

Sub-task

18.05 Diagnoses interior and exterior components and trim.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

18.05.01	knowledge of trim hardware, fasteners, adhesives and cleaners
18.05.02	knowledge of upholstery, carpet and roof lining

18.05.03	knowledge of seat construction
18.05.04	ability to recognize flaws in fit, finish and function

Sub-task

18.06 Diagnoses latches, locks and movable glass.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

18.06.01	knowledge of door components such as latches, locks and linkages
18.06.02	knowledge of movable glass components such as channels, regulators and weather stripping
18.06.03	knowledge of electrical/electronic systems associated with doors and windows
18.06.04	ability to remove trim components to access inside of door
18.06.05	ability to identify misaligned, worn, damaged or defective components

Task 19 Repairs body components, trim, restraint systems and installed accessories.

Sub-task

19.01 Repairs active restraint systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

19.01.01	knowledge of seat belt mounting and operation
19.01.02	knowledge of seat belt warning system

19.01.03	ability to follow manufacturers' specifications and recommendations
19.01.04	ability to remove and replace worn, damaged or defective seat belt components

Sub-task

19.02 Repairs passive restraint systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

19.02.01	knowledge of airbag mounting, operation and locations
19.02.02	knowledge of types of passive restraint systems such as front impact airbags, curtain airbags and seat belt pretensioners
19.02.03	knowledge of impediments to proper air bag operation such as glass and trim items, seat covers and placement of child seats
19.02.04	knowledge of airbag monitoring system
19.02.05	knowledge of progressive airbag deployment
19.02.06	ability to follow manufacturers' specifications and recommendations
19.02.07	ability to handle and remove airbag modules
19.02.08	ability to disarm and rearm airbag systems
19.02.09	ability to verify airbag self-test
19.02.10	ability to access and interpret diagnostic codes

Sub-task

19.03 Repairs problems with wind noise and water leaks.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	no	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

19.03.01	knowledge of seals, adhesives and sealing materials
19.03.02	knowledge of basic aerodynamics
19.03.03	ability to perform body adjustments
19.03.04	ability to remove and replace worn, damaged or defective components

Sub-task

19.04 Repairs problems with NVH (noise, vibration, harshness).

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	no	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

19.04.01	knowledge of vibration emitters, conductors, generators and resonators
19.04.02	knowledge of basic aerodynamics
19.04.03	knowledge of materials used to dampen or interrupt vibration such as tapes, adhesives and dampers
19.04.04	ability to disassemble and re-assemble problem components or areas

Sub-task

19.05 Repairs interior and exterior components and trim.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	no	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

19.05.01	knowledge of trim hardware, fasteners, adhesives and cleaners
19.05.02	knowledge of upholstery, carpet and roof lining
19.05.03	knowledge of seat construction
19.05.04	ability to follow manufacturers' specifications and recommendations
19.05.05	ability to remove, select and re-apply adhesives and fasteners
19.05.06	ability to adjust components for fit, finish and function
19.05.07	ability to remove and replace interior components and trim
19.05.08	ability to remove and replace exterior components and trim

Sub-task

19.06 Installs interior and exterior accessories.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

19.06.01	knowledge of basic electrical circuitry
19.06.02	knowledge of hardware
19.06.03	knowledge of safety procedures
19.06.04	knowledge of regulations and safety standards

19.06.05	knowledge of vehicle design and construction
19.06.06	ability to follow manufacturers' recommendations and limitations
19.06.07	ability to select and use fasteners

Sub-task

19.07 Repairs latches, locks and movable glass.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	NV

19.07.01	knowledge of door components such as latches, locks and linkages
19.07.02	knowledge of movable glass components such as channels, regulators and weather stripping
19.07.03	knowledge of electrical/electronic systems associated with doors and windows
19.07.04	ability to remove, replace and adjust defective components
19.07.05	ability to remove trim components to access inside of door

APPENDICES

TOOLS AND EQUIPMENT

Standard Tool Kit

air hammer/chisel
air ratchet
antifreeze tester
axle boot clamp tool
battery post service and reshape tool
belt tension release tool
blow gun
bolt extractor set (easy outs)
brake service tools (adjusters, spring removal and installation tools, caliper tools)
caulking gun
centre punch
chisels, punches
compression tester
creeper/fender covers
crowfoot wrenches
dial indicator set
die grinder
drill and bits
drill gauge
feeler gauges – SAE and metric
files – bastard cut/half round/mill cut/square
filter wrenches
flare nut wrenches – SAE and metric
flaring tool (SAE, metric and ISO)
flash lights
fuel injector noid lights
fuel line disconnect set
hacksaw
hammers – ball peen/dead blow/rubber mallet/softface
hex keys – SAE and metric
impact driver and bits
impact wrench and impact socket set – SAE and metric
inspection mirror
jumper lead
magnetic pick up tool
mechanic's pick set
multimeter (DVOM)
nut driver set – SAE and metric
pliers – slip joint, needle nose, multipurpose adjustable, side cutter, snap ring and inside pliers
pry bar
pullers – gear, pulley, battery terminal and steering wheel
ratchet and sockets – ¼, ⅜ and ½ drive – SAE and metric, swivel, spark plug, extensions and adapters
rivet gun
scraper (gasket and carbon)
screwdriver set
seal drivers and extractors
soldering tools
spark plug gapper
spark tester
standard test leads and probes
stethoscope
straight edge
stud extractor
tap and die set – SAE and metric
tape and ruler
terminal remover tools
test lamp
thermometer
thread files
timing light
tin snips – centre, left and right cut
tire pressure gauge
tool box
torque angle meter/indicator
torque limited sockets (torque sticks)
torque wrenches – various sizes and ranges
torx bits
tread depth gauge (for tires and brakes)
trouble light
tube bending tool
tube cutters
upholstery tools – trim panel tools, hog ring pliers
utility knife

Standard Tool Kit (continued)

vacuum pump
vacuum/pressure gauge
vernier caliper – SAE and metric
vise grips
wire brush
wire stripper/crimping tool
wrench set – SAE and metric/various designs

Shop Tools and Equipment

acetylene torches
airbag removal tools
airbag simulators
air compressor – hoses – inline filter and water separators
air conditioning flushing equipment
air conditioning leak detection and inspection equipment
air conditioning recovery/recycle/recharge station
air conditioning service and repair tools
alignment equipment
anti-static devices
ball joint press and adapters
battery chargers/boosting equipment
battery tester/alternator and starter tester (AVR)
bearing remover
belt tension gauge
bench grinders
bench vises
black light
borescope
brake cylinder hone
brake drum gauge/micrometer
brake lathe
brake pressure tester
brake rotor gauge/micrometer
brake system bleeder
break out boxes
calibrated vessel
camshaft bearing tools (removal and installation)
chassis ears
clutch alignment tools
clutch installers and removers
compression leak down tester
computer – PC
coolant drain pans
cooling system pressure tester
cooling system recovery and flushing station
core plug/expansion plug installation tool
cylinder ridge reamer
drill press
electrical short detector
engine analyzer (oscilloscope)
engine and transmission supports
engine cylinder hone
engine ears
engine hoist/block, tackle and hydraulic lift
engine stand – portable
EVAP test equipment
exhaust fan
exhaust pipe bender
exhaust ventilation (hoses)
floor jack
flushing and bleeding equipment
fuel injector flushing kit
fuel recovery and storage station
funnels
gear puller set
grease gun – oil dispensing system, fluid suction pump
hydraulic press
hydraulic transmission jack
jack stands and supports
leak detection equipment (refrigerants)
leak detection tank (tires)
lock pick set – lock out tools
manometer
oil drain barrels and disposal system
parts washers/steam cleaners and blaster
piston ring compressor
piston ring installer
power steering pressure tester
presses
pressure washer
propane enrichment tools
pullers
shop vacuum
slide hammer
smoke machine
specialized tools for air conditioning systems
specialized tools for engines and transmission
spreaders
spring compressors – coil spring and strut spring

Shop Tools and Equipment (continued)

tire changing machine
tire repair equipment
transmission fixtures
transmission pressure test kit
upholstery tools
valve grinding equipment
valve spring compressor
vehicle hoist
vehicle service information system
water hose
welding equipment – GMAW welder and oxy fueled
wheel alignment equipment
wheel balancer
wheel chocks
wheel ramps

Measuring Tools and Equipment

air conditioning pressure gauge
ammeter
AVR
back pressure gauge
ball joint dial indicator set
battery tester
coolant system pressure tester
cylinder bore gauges – small bore gauge, telescoping gauge
electronic vibration analyzer
fuel pressure gauges
headlight aiming equipment
hole gauge
inclinometer
micrometer – SAE and metric
oil pressure gauge set – engine/transmission
plastic gauge
power steering pressure tester
pressure gauges
pyrometer
refractor
scan tools
sirometer
spring scale
torque angle meter/indicator

Safety and Personal Protection Equipment

body protection – shop apron/heat resistant arm protectors
eye protection – face shield/goggles/safety glasses/welding goggles
eye wash station
fire extinguishers
first aid station
foot protection – steel toe boot
hand protection – chemical/heat resistant/abrasion, leather and disposal latex gloves
hearing protection – ear muffs/ear plugs
respiratory protection – dust and particle masks/chemical filtered mask

GLOSSARY

ammeter	instrument used to measure electrical current flow in a circuit.
AVR	alternator voltage regulator; refers to a device that is used to test generators/alternators for electrical output, voltage and amperage.
Block A Occupational Skills	repetitive general skills for many tasks performed by an automotive service technician.
Block B Engine Systems	this block consists of the basic engine components and their related support systems.
Block C Vehicle Management Systems	this block consists of the diagnosis and repair of computer controlled modules and their related circuitry and software, including systems such as engine management, transmission controls and ABS systems.
Block D Drive Line Systems	this block consists of the components that direct the power flow from the engine to the wheels.
Block E Electrical and Comfort Control Systems	this block consists of the diagnosis and repair of the vehicle electrical system including accessories, options and entertainment systems as well as the vehicle comfort systems.
Block F Steering, Suspension, Braking and Control Systems	this block consists of the components that control the steering, handling, support and braking of the vehicle.
Block G Body Components, Trim and Restraint Systems	this block consists of restraint systems, trim systems and other body components of the vehicle.
CAN	a protocol for communication between electronic/computer modules.
condenser (A/C)	device used in an air conditioning system to allow the dissipation of heat.
condenser (electrical)	electrical device that acts to store an electrical charge preventing voltage surges.
DVOM	meter for measuring voltage, amperage, resistance (ohms) and is digital in its operation.
gerotor	a positive displacement pump which utilizes a drive shaft with an inner and outer rotor.

inclinometer	device used to measure the incline of an object, measured in degrees.
jounce	the motion of a wheel that compresses its suspension. Full jounce refers to a wheel that is at the upper limits of its travel. Jounce is the opposite of rebound.
manometer	a graduated tube containing water which measures pressure/vacuum in units of water column.
micrometer	a precision measuring device for small distances.
O_2 Sensor	device used to measure the oxygen content of exhaust gases.
OBD I and OBD II	on board diagnostics are part of a vehicle's engine management software used to monitor system performance. OBD II is a second generation program that performs as dictated by standards established by the Society of Automotive Engineers.
Ohm's Law	the relationship between current, resistance and voltage in any electrical circuit. Voltage in circuit is equal to the current (in amperes) multiply by the resistance (in ohms).
pneumatic	operated by compressed air.
pyrometer	instrument used to measure temperatures.
refractor	test instrument used to measure the strength of antifreeze or specific gravity of electrolyte in a cell of a lead/acid battery.
sirometer	test instrument used to measure RPM of an engine or frequency of a vibration with great accuracy.
UART	a protocol for communication between computer modules.

ACRONYMS

ABS	antilock braking systems
A/C	air conditioning
ACP	air conditioning pressure
AVR	alternator voltage regulator
CAN	controller area network
CO	carbon monoxide
CO_2	carbon dioxide
CV	constant velocity
DVOM	digital voltage ohmmeter
EGR	exhaust gas recirculation
EVAP	evaporative emission control systems
GMAW	gas metal arc welding
HC	hydrocarbons
HS	high speed
HVAC	heating, ventilation and air conditioning
ISO	International Standards Organization
NO_X	oxides of nitrogen
NVH	noise, vibration, harshness
OAW	oxy-acetylene welding
OBD I	On board diagnostics (first generation)
OBD II	On board diagnostics (second generation)
PCV	positive crankcase ventilation
PROM	programmable read only memory

RPM	revolutions per minute
SAE	Society of Automotive Engineers
TCS	traction control system
TPS	throttle position sensor
TSB	technical service bulletins
UART	universal asynchronous receive transmit
VIN	vehicle identification number
VSS	vehicle speed sensor
WHMIS	Workplace Hazardous Materials Information System

BLOCKS AND TASKS WEIGHTING

BLOCK A OCCUPATIONAL SKILLS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	9	7	5	8	NV	3	8	8	5	8	20	10	NV	8%

Task 1 Uses tools and equipment.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	29	30	25	31	NV	30	30	31	50	60	50	35	NV	37%

Task 2 Organizes work.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	20	30	22	NV	30	20	19	35	10	25	25	NV	23%

Task 3 Performs general maintenance and diagnosis.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	51	50	45	47	NV	40	50	50	15	30	25	40	NV	40%

BLOCK B ENGINE SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	17	16	15	18	NV	35	10	28	15	10	20	18	NV	18%

Task 4 Diagnoses engine systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	22	25	30	30	NV	20	30	20	30	10	30	28	NV	25%

Task 5 Repairs engine systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	26	25	20	22	NV	20	20	23	20	20	20	22	NV	22%

Task 6 Diagnoses engine support systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	28	25	30	26	NV	35	30	34	30	50	30	28	NV	31%

Task 7 Repairs engine support systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	24	25	20	22	NV	25	20	23	20	20	20	22	NV	22%

BLOCK C VEHICLE MANAGEMENT SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	17	22	25	18	NV	10	23	11	25	25	9	22	NV	19%

Task 8 Diagnoses vehicle management systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	56	60	65	56	NV	70	70	59	70	70	65	65	NV	64%

Task 9 Repairs vehicle management systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	44	40	35	44	NV	30	30	41	30	30	35	35	NV	36%

BLOCK D DRIVE LINE SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	17	14	15	14	NV	16	13	14	10	12	13	13	NV	14%

Task 10 Diagnoses drive line systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	57	60	50	55	NV	60	40	47	50	30	65	55	NV	52%

Task 11 Repairs drive line systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	43	40	50	45	NV	40	60	53	50	70	35	45	NV	48%

BLOCK E ELECTRICAL AND COMFORT CONTROL SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	16	20	15	17	NV	14	22	17	15	12	9	11	NV	15%

Task 12 Diagnoses electrical systems and components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	40	40	35	31	NV	45	35	31	40	40	30	37	NV	37%

Task 13 Repairs electrical systems and components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	25	20	30	18	NV	15	15	25	20	10	20	27	NV	20%

Task 14 Diagnoses HVAC and comfort control.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	19	20	20	30	NV	25	35	25	20	20	30	18	NV	24%

Task 15 Repairs HVAC and comfort control.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	16	20	15	21	NV	15	15	19	20	30	20	18	NV	19%

BLOCK F STEERING, SUSPENSION, BRAKING AND CONTROL SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	16	18	20	16	NV	16	17	14	25	25	20	18	NV	19%

Task 16 Diagnoses steering, suspension, braking and control systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	54	50	65	56	NV	60	40	59	70	40	65	55	NV	56%

Task 17 Repairs steering, suspension, braking and control systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	46	50	35	44	NV	40	60	41	30	60	35	45	NV	44%

BLOCK G BODY COMPONENTS, TRIM AND RESTRAINT SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	8	3	5	9	NV	6	7	8	5	8	9	8	NV	7%

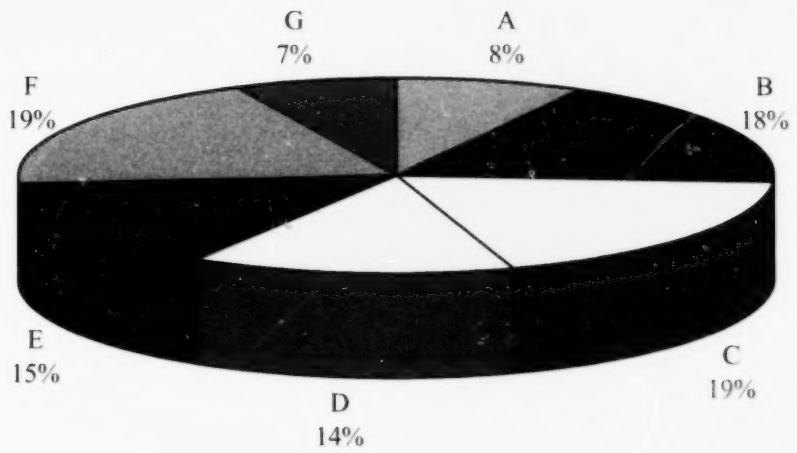
Task 18 Diagnoses body components, trim and restraint systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	51	50	50	54	NV	50	10	53	60	60	65	50	NV	50%

Task 19 Repairs body components, trim, restraint systems and installed accessories.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	49	50	50	46	NV	50	90	47	40	40	35	50	NV	50%

PIE CHART*



TITLES OF BLOCKS

Block A	Occupational Skills	Block E	Electrical and Comfort Control Systems
Block B	Engine Systems	Block F	Steering, Suspension, Braking and Control Systems
Block C	Vehicle Management Systems		
Block D	Drive Line Systems	Block G	Body Components, Trim and Restraint Systems

* Average percentage of the total number of questions on an interprovincial examination, assigned to assess each block of the analysis, as derived from the collective input from workers within the occupation from all areas of Canada. Interprovincial examinations typically have from 100 up to 150 multiple-choice questions on each examination.

TASK PROFILE CHART - AUTOMOTIVE

	BLOCKS	TASKS				
A	OCCUPATIONAL SKILLS	**1. Uses tools and equipment.**	1.01 Uses hand tools.	1.02 Uses power tools.	1.03 Uses measuring and testing devices.	1.04 Uses hoistin lifting equipment
		2. Organizes work.	2.01 Communicates with others.	2.02 Uses technical information.	2.03 Maintains safe work environment.	2.04 Estimates jo
		3. Performs general maintenance and diagnosis.	3.01 Maintains vehicle to specifications.	3.02 Inspects for potential problems.	3.03 Performs diagnostic procedures.	
B	ENGINE SYSTEMS	**4. Diagnoses engine systems.**	4.01 Diagnoses cooling systems.	4.02 Diagnoses lubricating systems.	4.03 Diagnoses base engine.	
		5. Repairs engine systems.	5.01 Repairs cooling systems.	5.02 Repairs lubricating systems.	5.03 Repairs base engine.	
		6. Diagnoses engine support systems.	6.01 Diagnoses fuel delivery systems.	6.02 Diagnoses ignition systems.	6.03 Diagnoses intake exhaust systems.	6.04 Diagnoses emission systen
		7. Repairs engine support systems.	7.01 Repairs fuel delivery systems.	7.02 Repairs ignition systems.	7.03 Repairs intake exhaust systems.	7.04 Repairs en systems.

B-TASKS ——————————————————→

nd	1.05 Uses welding/cutting equipment.	1.06 Uses safety equipment.	1.07 Uses shop equipment.

cost.

	6.05 Diagnoses accessory drive systems and mounts.

sion	7.05 Repairs accessory drive systems and mounts.

BLOCKS		TASKS	← SU			
C	VEHICLE MANAGEMENT SYSTEMS	8. Diagnoses vehicle management systems.	8.01 Reads diagnostic codes.	8.02 Monitors parameters.	8.03 Interprets test results.	8.04 Tests compone and system circuitry.
		9. Repairs vehicle management systems.	9.01 Reprograms component software.	9.02 Replaces components.	9.03 Repairs electrical connections and wiring.	9.04 Verifies repair using drive cycles.
D	DRIVE LINE SYSTEMS	10. Diagnoses drive line systems.	10.01 Diagnoses drive shafts and axles.	10.02 Diagnoses manual transmissions/transaxles.	10.03 Diagnoses automatic transmissions/transaxles.	10.04 Diagnoses clutches.
		11. Repairs drive line systems.	11.01 Repairs drive shafts and axles.	11.02 Repairs manual transmissions/transaxles.	11.03 Repairs automatic transmissions/transaxles.	11.04 Repairs clut
E	ELECTRICAL AND COMFORT CONTROL SYSTEMS	12. Diagnoses electrical systems and components.	12.01 Diagnoses starting/charging systems and batteries.	12.02 Diagnoses basic wiring and electrical systems.	12.03 Diagnoses lighting and wiper systems.	12.04 Diagnoses entertainment sys
		13. Repairs electrical systems and components.	13.01 Repairs starting/charging systems and batteries.	13.02 Repairs basic wiring and electrical systems.	13.03 Repairs lighting and wiper systems.	13.04 Repairs entertainment sys
		14. Diagnoses HVAC and comfort control.	14.01 Diagnoses air flow control systems.	14.02 Diagnoses refrigerant systems.	14.03 Diagnoses heating systems.	
		15. Repairs HVAC and comfort control.	15.01 Repairs air flow control systems.	15.02 Repairs refrigerant systems.	15.03 Repairs heating systems.	

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TASKS →

	10.05 Diagnoses transfer cases.	10.06 Diagnoses differentials.
	11.05 Repairs transfer cases.	11.06 Repairs differentials.
	12.05 Diagnoses electrical options.	12.06 Diagnoses electrical accessories.	12.07 Diagnoses instrumentation and information displays.
	13.05 Repairs electrical options.	13.06 Repairs electrical accessories.	13.07 Installs electrical accessories.	13.08 Repairs instrumentation and information displays.

	BLOCKS	TASKS	SU			
F	STEERING, SUSPENSION, BRAKING AND CONTROL SYSTEMS	**16. Diagnoses steering, suspension, braking and control systems.**	16.01 Diagnoses steering and control systems.	16.02 Diagnoses suspension and control systems.	16.03 Diagnoses braking and control systems.	16.04 Diagnoses wheels, hubs and bearings.
		17. Repairs steering, suspension, braking and control systems.	17.01 Repairs steering and control systems.	17.02 Repairs suspension and control systems.	17.03 Repairs braking and control systems.	17.04 Repairs tire wheels, hubs and bearings.
G	BODY COMPONENTS, TRIM AND RESTRAINT SYSTEMS	**18. Diagnoses body components, trim and restraint systems.**	18.01 Diagnoses active restraint systems.	18.02 Diagnoses passive restraint systems.	18.03 Diagnoses wind noise and water leaks.	18.04 Diagnoses (noise, vibration, harshness).
		19. Repairs body components, trim, restraint systems and installed accessories.	19.01 Repairs active restraint systems.	19.02 Repairs passive restraint systems.	19.03 Repairs problems with wind noise and water leaks.	19.04 Repairs pro with NVH (noise vibration, harshn

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	18.05 Diagnoses interior and exterior components and trim.	18.06 Diagnoses latches, locks and movable glass.	
	19.05 Repairs interior and exterior components and trim.	19.06 Installs interior and exterior accessories.	19.07 Repairs latches, locks and movable glass.